REMARKS

Claims 3, 5, 9, and 10 are pending in the application upon entry of the amendments and new claims. Claim 3 has been amended for consistency and to better describe certain aspects of the invention. Claims 9 and 10 have been added to further describe the invention. Claims 1, 2, 4, and 6-8 have been cancelled without prejudice. Favorable reconsideration in light of the amendments, the new claims, the partial translation of Ryu, and the remarks which follow is respectfully requested.

The Amendments

Claim 3 has been amended into independent form without narrowing its scope. Support for the amendments to claims 3 exists in original claim 1 and the specification, for example, page 16, last paragraph.

New claims 9 and 10 are supported by the specification, for example, in Examples 11 to 13 and Examples 16 to 18. In Examples 11 to 13, the ester (a8), which corresponds to ester (B), is obtained from NPG-EO (molar amount of addition: 4) and pentanoic acid, and in Examples 16 to 18, the ester (b7), which also corresponds to ester (B), is obtained from NPG-BO (molar amount of addition: 2) and nonanoic acid. Since the new claims are fully supported by the specification, no new matter is added by the new claims.

The Invention

A lubricating base stock for internal combustion engine oil as required by claim 3 consists essentially of an ester (A) and an ester (B) having an average molecular weight that is different from that of the ester (A); wherein the ester (A) is obtained from an ethylene oxide adduct of diol having a neopentyl structure and a saturated aliphatic monocarboxylic acid having 4 to 12 carbon atoms, the ethylene oxide adduct is obtained by adding ethylene oxide to a diol having a neopentyl structure in a ratio of 1 to 4 moles with respect to 1 mol of the diol,

and the saturated aliphatic monocarboxylic acid is a linear carboxylic acid or a mixture of saturated aliphatic monocarboxylic acids comprising a linear aliphatic monocarboxylic acid in a ratio of at least 50 mol%; wherein the ester (B) is obtained from a neopentyl polyol alkylene oxide adduct and a saturated aliphatic monocarboxylic acid; a weight ratio of the ester (A) and the ester (B) is 80 : 20 to 99.9 : 0.1; and a dynamic viscosity of the lubricating base stock for internal combustion engine oil at 100°C is 1 to 5 mm^2/s, a viscosity index of the lubricating base stock is at least 140, and a total acid value of the lubricating base stock is 0.5 mg KOH/g or less.

That is, notable features of the invention include the combined use of the specific ester (A) and the specific ester (B) at a ratio of 80 : 20 to 99.9 : 0.1 and that the obtained mixed ester is carefully prepared so as to have a specific dynamic viscosity, a specific viscosity index, and a specific total acid value. As a result of the above features, a lubricating base stock for internal combustion engine oil desirably having a high viscosity index and a small change of shear viscosity due to temperature change (i.e., a small shear viscosity ratio) is provided, and the obtained lubricating base stock contributes to improve fuel efficiency.

Conventionally, for the purpose of improving fuel efficiency in the automobile industry, a lubricating oil having a small change of dynamic viscosity in response to a change in temperature, a lubricating oil having a high viscosity index is employed. However, even when conventional lubricating base stocks having a high viscosity index are employed, the improvement of fuel efficiency cannot be reached to a satisfactory level. Since shear is loaded to the lubricating oil when it is applied to sliding portions of the actually working machine or engine, the inventors considered that it may be important to improve the viscosity (i.e., shear viscosity) characteristics of the lubricating oil in a state in which shear load is applied in order to achieve higher efficiency / higher fuel efficiency and maintain the lubricity at high temperatures. The inventors

generated the technical idea that the lubricating base stock should have high viscosity index and small shear viscosity ratio (shear viscosity at 100°C / shear viscosity at 150°C) in order to better improve fuel efficiency.

This technical idea is unique. The uniqueness of the technical idea is better understood when referring to the experimental data of Tables 1 and 2 in the specification. On one hand, ester (a2) has the viscosity index of 146 and the shear viscosity ratio of 1.91. On the other hand, ester (a4) has the viscosity index of 189 and the shear viscosity ratio of 1.98. According to conventional thinking which dictates that only the viscosity index improves fuel efficiency, ester (a4) having a relatively high viscosity index compared the viscosity index of ester (a2) should be chosen. However, the result was different. The ester (a2) that has lower shear viscosity unexpectedly showed better fuel efficiency. These results demonstrate that the shear viscosity ratio is also important to improve fuel efficiency. In this way, when the lubricating base stock has a predetermined viscosity index (i.e., the viscosity index is at least 140), it is important that the shear viscosity ratio should be considered in order to obtain the lubricating base stock for improving fuel efficiency.

The research of the inventors is based on the above technical idea. As a result, the inventors found that a mixed ester consisting of the specific ester (A) and the specific ester (B) at a ratio of 80 : 20 to 99.9 : 0.1 and having a specific dynamic viscosity, a specific viscosity index, and a specific total acid value has a high viscosity index and has a small shear viscosity ratio compared with that of ester (A) and ester (B), respectively, and thus achieved the invention. Claim 3 has been amended to better capture this technical idea.

The Double Patenting Rejection

Claims 1and 2 have been rejected under the judicially created doctrine of obviousness-type double patenting over U.S. Patent 6,617,289. The cancellation of claims 1 and 2 renders this rejection moot.

The First Obviousness Rejection

Claims 1-3 have been rejected under 35 U.S.C. § 103 over Kimura (JP 07-305079). Kimura discloses that a lubricating oil that contains a polyether polyol fatty acid ester obtained by adding 1 to 10 mol of an alkylene oxide to a neopentyl polyol that has 2 to 6 hydroxyl groups and that has no hydrogen atom in a carbon at ß-position, and esterifying the obtained adduct and a fatty acid having 8 to 22 carbon atoms.

The Examiner indicates that Kimura does not disclose the dynamic viscosity, viscosity index, or total acid value of the ester produced (as required by claim 3). The Examiner contends that the values of dynamic viscosity, viscosity index, and total acid value of the ester produced by Kimura are intrinsic properties.

Regarding intrinsic properties, since the lubricating base stock of claim 3 is obtained by mixing esters so as to have the specific dynamic viscosity, the specific viscosity index, and the specific total acid value, these specific values are not intrinsic. Consequently, claim 3 would not have been obvious over Kimura.

The Examiner indicates that Kimura does not disclose a mixture of two esters in the lubricant composition. Kimura discloses an ether formed from an alcohol consisting of neopentyl glycol, pentaerythritol, or a mixture of the alcohols to form an ester. The Examiner therefore contends that it would have been obvious that a composition comprising two esters is obtained. Applicants respectfully disagree.

In claim 3, it is important to combine the specific ester (A) and the specific ester (B) at a ratio of 80 : 20 to 99.9 : 0.1 and the obtained mixed ester should have a specific dynamic viscosity, specific viscosity index, and specific total acid value. The thus-obtained lubricating base stock for internal combustion engine oil of claim 3 has a high viscosity index and a small shear viscosity ratio. The lubricating base stock can better contribute to improving fuel

efficiency compared with an ester having high viscosity index, for example, each ester (A) and ester (B) that can improve fuel efficiency.

The Examiner's attention is respectfully directed to Table 3 of the specification. In Table 3, the shear viscosity ratio of a lubricating base stock consisting ester (A) (ester (a3)) and ester (B) (ester (a8)) at a weight ratio of 80 : 20 to 99.9 : 0.1 in Examples 11 to 13 is smaller than that of a lubricating base stocks consisting only ester (A) (ester (a3)) in Example 14, or that of a lubricating base stock consisting only ester (B) (ester (a8)) in Example 15. On the other hand, as seen Comparative Example 8, when the weight ratio of ester (A) (ester (a3)) and ester (B) (ester (a8)) is not in the range of 80 : 20 to 99.9 : 0.1, the shear viscosity ratio of the lubricating base stock is larger than that of the lubricating base stocks that consists of only ester (A) (ester (a3)) or only ester (B) (ester (a8)) (Examples 14 and 15, respectively).

Kimura merely discloses that when an ester is used as engine oil, the value of a viscosity index, the pour point, coefficient of friction, withstand-load ability, a hot tube test, and an oxidation stability test are important. As seen from Tables 1 and 2 of Kimura (See the partial translation filed on June 7, 2004 as IDS), esters having high viscosity index are merely shown. In other words, Kimura merely discloses conventional esters, and suggests that a lubricating base stock may contain two kinds of esters. As stated above, Kimura fails to teach or suggest the technical idea that the lubricating base stock having small shear viscosity ratio should be used in order to improve fuel efficiency. Furthermore, Kimura fails to teach or suggest the combined use of the specific ester (A) and the specific ester (B) at a ratio of 80 : 20 to 99.9 : 0.1. Therefore, even if two esters are mixed from Kimura, the invention of claim 3 cannot be achieved. Therefore, it would not have been obvious over Kimura that two esters are mixed in order to improve fuel efficiency.

Finally, it is noted that claim 3 employs the closed ended language "consisting essentially of". Consequently, claim 3 effectively disclaims the

compositions of Kimura that do not teach base stock compositions having the unique properties of claim 3.

The Second Obviousness Rejection

Claims 4-8 have been rejected under 35 U.S.C. § 103 over Kimura in view of Gatto (US RE 37,363). Gatto discloses a lubricating composition that comprises a major amount of lubricating oil and an oil soluble molybdenum compound. However, Gatto fails to teach or suggest the combined use of the specific ester (A) and the specific ester (B) at a ratio of 80 : 20 to 99.9 : 0.1, and that the obtained mixed ester is prepared so as to have the specific dynamic viscosity, the specific viscosity index, and the specific total acid value of claim 5. Since Gatto does not cure the deficiencies of Kimura, claim 5 would not have been obvious over Kimura and Gatto.

The Third Obviousness Rejection

Claims 1-3 have been rejected under 35 U.S.C. § 103 over Ryu (JP 2001-139978) in view of Kimura. Ryu discloses a lubricating composition for an internal combustion engine comprised of mixed esters obtained by the reaction of an alkylene oxide, polyhydric alcohol, and fatty acid.

Ryu fails to teach or suggest the combined use of the specific ester (A) and the specific ester (B) at a ratio of 80 : 20 to 99.9 : 0.1, and that the obtained mixed ester is prepared so as to have the specific dynamic viscosity, the specific viscosity index, and the specific total acid value of claim 3.

Furthermore, Ryu excludes an ethylene oxide adduct of diol having a neopentyl structure that is employed in the ester (A) of claim 3. Submitted herewith is a translation of paragraph 0014 of Ryu. As seen from the description of paragraph 0014, Ryu discloses that the polyhydric alcohol should have at least three hydroxyl groups in one molecule, and that when a polyhydric alcohol having 2 hydroxyl groups is employed, the desired lubricating oil

composition cannot be obtained. In other words, Ryu teaches away from claim 3.

It is also noted that claim 3 employs the closed ended language "consisting essentially of". Consequently, claim 3 effectively disclaims the compositions of Ryu that do not teach base stock compositions having the unique properties of claim 3.

Since Ryu does not cure the deficiencies of Kimura, claim 3 would not have been obvious over Ryu and Kimura.

The Fourth Obviousness Rejection

Claims 4-8 have been rejected under 35 U.S.C. § 103 over Ryu in view of Kimura and Gatto. Since Gatto, Kimura and Ryu all fail to teach or suggest the combined use of the specific ester (A) and the specific ester (B) at a ratio of 80 : 20 to 99.9 : 0.1, and that the obtained mixed ester is prepared so as to have the specific dynamic viscosity, the specific viscosity index, and the specific total acid value of claim 5, Gatto, Kimura and Ryu cannot render claim 5 obvious.

Petition for Extension of Time

A request for a one month extension of time is hereby made. Payment is being made through the EFS electronic filing system.

Should the Examiner believe that a telephone interview would be helpful to expedite favorable prosecution, the Examiner is invited to contact Applicants' undersigned attorney at the telephone number listed below.

In the event any fees are due in connection with the filing of this document, the Commissioner is authorized to charge those fees to our Deposit Account No. 50-1063.

Respectfully submitted,

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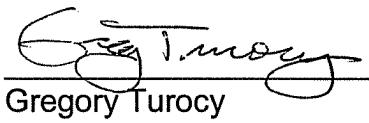

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